Tractor operated reaper windrower with reel

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"Khet main sabse jyada samasya kataai mein aati hai. Baaki sabhi kam ke liye machine hain, kaatai ke harvester bade kisan hi kharid sakte hain; isliye mujhe chhote kisano ke liye reaper market mein lana hai"

(In the field, maximum problems are faced during harvesting. For everything else, there are machines. But present harvesters can only be purchased by big farmers. I want to market a reaper meant for small farmers.)

It was this ambition that drove Bhagwan Singh Dangi, a farmer from a small village in Madhya Pradesh, to develop such a machine. His reaper windrower is machine which cuts the crop and windrows (a row of cut hay/small grain crop) it in the centre.

55-year-old Bhagwan Singh was born in a farmer's family. Even as a child, Bhagwan Singh was fascinated by machines. "I could sit for hours watching repairmen when they came to our house to fix farm machineries," he confides. As he grew a little older, he would pick up any wrist watch lying around the house and open it up to study what was inside.

Although his brothers are graduates, Bhagwan Singh was more interested in agriculture. In 1973, he quit school after class 12 to help his family with farming. He also followed up on his love of machineries and started tinkering with farm implements by way of building and repairing them.

First Success: A front mounted blade for tractors

Farming in his village was challenging. One of the first difficulties he faced was an uneven field dotted with pits. So he developed a front-mounted blade for tractors for land leveling and bunding. "I made this blade way back in 1982 but I still use it on my farm. Others have copied me but I am happy that my region now has many people adept at adding this farm implement to tractors," he shares proudly. His next

innovation, made in 1995, was a rubber accessory for increasing the discharge of bore-wells by over 40 per cent.

He continued mending small gadgets and farm implements for years before developing his reaper windrower.

Genesis of the innovation

Soybean is a major crop in his village. Labour shortage during peak harvesting season is a big problem. Trying to find a solution, Bhagwan Singh explored the market for machines that would harvest quickly and with minimal grain loss. He needed a machine to execute two main functions- reaping and windrowing. Reaping involves cutting the crops systematically while windrowing is laying the cut stalks in windrows for easy bundling and post harvesting processes.

Some of the machines he came across were self-propelled reapers placing the harvested crop on one side of the machine, which lead to high shattering losses. Moreover, large portions of the stalks were left in the fields, which required manual clearance before the next run. This arrangement was not feasible for small fields with frequent turns as it damaged the standing crop. The reaped crop was carried all along the row, which was dropped only at the turns. This created an unnecessary load on the engine and hence added to fuel consumption.

Unable to find a machine appropriate for his small-sized farm, he then thought about making one of his own. He conceptualized building a light, agile vehicle with a front mounted hexagonal rotating reel with mechanism for cutting and dropping the crops.

His first prototype was ready in 2001. Inspired, he decided to start his own workshop where he could give shape to his imagination and creativity. He took a loan against his property and opened the workshop in 2004. All this while he continuously worked on the design and improved his idea. The modified self propelled machine had a 18 hp engine prime mover

instead of the earlier 2 hp one and a centrally placed reaping windrowing machine. It took him over a year and 10 lakh rupees to develop, test and modify the individual components and assemblies.

Considering its applications, NIF facilitated its value addition by developing it as attachment for tractor at CSIR- CMERI Durgapur under the NIF-CSIR cooperation. With this support, Bhagwan Singh has been able to develop the reaper windrower as an attachment that can be mounted in the front of a tractor, which seems to have a huge potential.

The tractor operated reaper windrower

This is a front mounted attachment for tractor. It has three different units namely, reel unit for pushing the standing crop towards the cutter bar, cutting unit, which consists of cutter bar, and gathering unit to windrow the crop at centre of the machine thus making it easy to handle/transport to the threshing floor. It reduces manpower requirement and the drudgery involved in the harvesting process.

A design modification in windrower unit does away with the problem of shattering loss, or breakage of grains, in the subsequent turn as the tyres do not run over the harvested crop.

The machine requires only one person to drive the unit and two persons at the rear to collect the produce. Apart from soybean, it can be used to harvest wheat, paddy and pulses. It is capable of working in small fields, taking sharp turns and not damaging the standing crops.

In conventional reaper units, the harvested crop is dropped perpendicular to the travel of the prime mover causing a lot of grain loss. The novelty of the innovation lies in the design and spatial arrangement of the windrowing attachment, which achieves minimal grain loss. The gathered crop drops in line between the tyres in a neat row for collection and facilitates the next parallel run.

As per tests at CIAE Bhopal in soybean crop, the machine demonstrated a field capacity of 0.35 ha per hour (at forward speed of 1.93 - 2.10 kmph). The total harvesting losses were reported to be 3.37%, including 2.33% pre-harvesting losses (i.e. losses while harvesting was done with this machine were 1.04%) and uncut loss were zero.

The innovation has featured in national media including Start TV, Yojana and The Hindu and has also received local media coverage. This has resulted in over 150 enquiries from various districts. A patent was filed by NIF in the name of innovator in 2011 (677/MUM/2011)

Future Dreams

"I dream of the day when my reaper unit would be used by marginal farmers across the country. My family was apprehensive while I was working on it because of the money involved. But they never discouraged me," he says. He accepts that his wife Radha was his staunchest supporter. "She never doubted me. She has just studied till class 8 and was not even sure of what I was doing. But she never told me that I am wasting my time with this innovation," he states in a voice full of pride.

All his children are graduates. "Now, I want to create an enterprise based on my innovation, which my children can take forward," he mentions. Farmers in the area have seen this implement in use and are asking him for it. However, financing is a problem because they do not have the money to pay for it in cash and there are no options of bank loans etc.

He feels farming practices need to change for better growth. "*Aaj kheti karne ka dhang achcha nahi hai, hame tarakki karne ke liye kheti karne ka tareeka badalna padega,*" he believes. And he wants to contribute to the change by way of developing new farm implements, agricultural practices and seed varieties.